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Groundwater
sampling results,
Livingston Rail
Yard, Livingston,
Montana

GROUND WATER SAMPLING RESULTS
LIVINGSTON RAIL YARD
LIVINGSTON, MONTANA

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GROUND WATER SAMPLING RESULTS
LIVINGSTON RAIL YARD
LIVINGSTON, MONTANA

July, 1989

Submitted to:

Montana Department of Health
and Environmental Services
Cogswell Building
Helena, Montana 59620

Submitted by:

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Submittal Date:

September 15, 1989

1.0 INTRODUCTION

Envirocon, Inc. completed the second round of monthly ground water sampling at the Burlington Northern rail yard in Livingston, Montana during July 25-28, 1989. A total of seventeen samples were taken from the thirteen monitoring wells. As shown on Figure 1.0, twelve samples were taken with dedicated samplers, and five samples were taken with a non-dedicated hand pump sampler. Three samples were field duplicates and one was an equipment blank.

Wells L-87-4 and LS-11 were replaced by wells L-87-7 and L-88-10 in the July sampling round. This change was discussed in the June 1989 sampling report, and will provide data to more adequately define the solvent plume. Monitoring wells 1, 2, and 11 were sampled in addition to the regular ten monthly wells in the July sampling round.

All samples were analyzed for volatile organic compounds by EPA method 601 at Energy Laboratories, Inc. (ELI) in Billings, Montana. Table 1.0 and 2.0 summarize the results of these analyses. Complete laboratory results are included in Appendix A.

2.0 RESULTS

The predominant contaminants detected were tetrachloroethene (PCE), trichloroethene (TCE), and cis-1, 2-dichloroethene (cis-DCE). As shown on Table 1.0, July concentrations are similar to those reported for the May and June sampling rounds. The only location which showed a significant change in the concentrations was well 7. An interpretation of these results is presented in Section 3.0.

Chlorinated benzenes and toluenes were detected in concentrations from 1 to 10 ug/l in wells L-87-7, L-88-10, and L-88-13, as shown in Table 2.0. Trichlorofluoromethane at a concentration of 7.9 ug/l was also detected at well L-88-10. A discussion of these compounds and their concentrations is presented in Section 3.0.

3.0 INTERPRETATION

The close correlations between May, June, and July concentrations of PCE, TCE, and cis-DCE reflect minimal change in the aquifer system. The relatively small (less than 0.5 feet) water level changes in most wells on the rail yard over this period indicates the minimal change in aquifer dynamics. Future monthly and quarterly sampling and water level measurements will be used to more clearly define the relationship between recharge conditions and the resulting contaminant concentrations.

Well 7 had a water level rise of more than two feet between May and

TABLE 1.0

SUMMARY OF ANALYTICAL RESULTS

July, 1989

Well Number	Sample Number	Sample Method	Det. Lim.	PCE			Det. Lim.	TCE			Det. Lim.	cis-DCE		
				May	June	**July**		May	June	**July**		May	June	**July**
L-87-5	140101-042	Ded.	0.5	335	350	**349**	0.5	8.7	11	**15**	1	5.4	6.2	**7.5**
L-87-3	140101-043	Ded.	0.5	262	183	**188**	0.5	24	22	**18**	1	68	121	**81**
8	140101-044	Ded.	0.5	180	188	**151**	0.5	9.9	10	**8.5**	1	17	24	**35**
7	140101-045	Ded.	0.5	**33**	**7.9**	**0.77**	0.5	1.2	ND	**ND**	1	2.9	1.3	**ND**
7 (DUP)	140101-046	Ded.	0.5			**0.9**	0.5			**ND**	1			**ND**
L-87-8	140101-047	Ded.	0.5	58	32	**68**	0.5	7.8	4.3	**7.3**	1	3.5	2.4	**6.1**
L-88-13	140101-048	Ded.	0.5	52	62	**69**	0.5	7.6	8.1	**11**	1	6.8	8.1	**17**
L-87-7	140101-049	Ded..	0.5	NS	NS	**ND**	0.5	NS	NS	**ND**	1	NS	NS	**ND**
LS-8	140101-050	Ded.	0.5	146	181	**165**	0.5	20	16	**16**	1	83	69	**49**
LS-8 (DUP)	140101-051	Ded.	0.5			**136**	0.5			**14**	1			**45**
L-88-10	140101-052	Ded.	0.5	160	NS	**137**	0.5	31	NS	**28**	1	105	NS	**195**
6	140101-053	Ded.	0.5	7.1	11	**7.2**	0.5	ND	0.5	**ND**	1	ND	ND	**ND**
1	140101-054	Wat.	0.5	NS	NS	**0.66**	0.5	NS	NS	**ND**	1	NS	NS	**ND**
2	140101-055	Wat.	0.5	NS	NS	**0.7**	0.5	NS	NS	**ND**	1	NS	NS	**ND**
11	140101-056	Wat.	0.5	NS	NS	**ND**	0.5	NS	NS	**ND**	1	NS	NS	**ND**
11 (DUP)	140101-057	Wat.	0.5			**ND**	0.5			**ND**	1			**ND**
EQ. BLANK	140101-058	Wat.	0.5			**ND**	0.5			**ND**	1			**ND**
LS-8 LAB DUP			0.5			**163**	0.5			**16**	1			**50**
7 LAB DUP			0.5			**0.9**	0.5			**ND**	1			**ND**
1 LAB DUP			0.5			**0.9**	0.5			**ND**	1			**ND**

NOTES:
NS - Not sampled
ND - Not detected

Ded. - Dedicated sampler
Wat. - Waterra hand pump sampler

All values in ug/l

TABLE 2.0

SUMMARY OF ANALYTICAL RESULTS
WELLS L-87-7, L-88-10, AND L-88-13
JULY, 1989

WELL NUMBER	SAMPLE NUMBER	CHLORO-BENZENE	2-CHLORO-TOLUENE	1,2-DICHLORO-BENZENE	1,3-DICHLORO BENZENE	1,4-DICHLORO BENZENE	TRICHLORO-FLUOROMETHANE
		DL - 1.0	DL- 1.0	DL - 1.0	DL - 1.0	DL - 0.5	DL - 1.0
L-88-10	140101-052	10	1	1	1	1.1	6.7
L-87-7	140101-049	ND	1.1	ND	ND	ND	ND
L-88-13	140101-048	2.2	ND	ND	ND	ND	ND

NOTE: All values in ug/l.
ND - Not detected
DL - Detection limit (ug/l)

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July. Over this same period, the PCE concentration decreased from 33 ug/l to 0.77 ug/l. The decrease in concentration at the northern edge of the plume may be the result of dilution within the chlorinated solvent plume by localized irrigation and natural recharge.

As shown in Table 2, chlorobenzene and 2-chlorotoluene were detected in wells L-88-13 and L-87-7 respectively. Chlorobenzene and 2-chlorotoluene are not detected further upgradient in wells with large concentrations of PCE, TCE, and cis-DCE near the rail yard shops. Therefore, the source of these compounds may be separate from the source of chlorinated solvents. Because concentrations were small and this is the first occurrence of these compounds, further sampling, with time will be used to aid in identification of their source.

The compounds and concentrations detected at well L-88-10 are anomalous in comparison to surrounding wells. The range of compounds detected is larger than in any other monitoring well and the ratio of PCE to DCE is significantly smaller. In addition, well L-88-10 is the only place where trichlorofluoromethane was detected. The concentrations of chlorinated compounds detected in well L-88-10 match closely with concentrations from the May sampling round.

The compounds detected at well L-88-10 may be the result of waste disposal at the cinder pile. However, the potentiometric contours shown on Figure 1.0 indicate that if these wastes are from the cinder pile, they should also be detected at well L-87-3. As shown on Table 2.0, this is not the case. If the cinder pile is the source of the compounds detected in well L-88-10, the wastes must have been dumped on the extreme southeast edge of the pile. A review of available aerial photography from 1942 to the present failed to detect a dumping point in this area.

4.0 QA/QC RESULTS

Envirocon followed the QA/QC program outlined in Section 10 of the Interim Measures Remedial Work Plan (IMRWP) during the July 1989 monthly sampling round. This program includes:

Field QA/QC
- field duplicates
- trip blanks
- equipment blanks

Laboratory QA/QC
- spiked analyses
- laboratory duplicates
- EPA QA/QC samples

QA/QC samples were analyzed by the same EPA method 601 as the field samples.

4.1 FIELD QA/QC

Three field duplicates, three trip blanks, and one equipment blank were used to validate field procedures. Field QA/QC results are discussed in section 4.1.1.

4.1.1 Field Duplicates

Field duplicates from wells 7,11, and LS-8 were sent blind to ELI. As shown in Appendix A, analysis of the duplicates show excellent correlation with the original samples from these wells. This indicates that laboratory procedures are sufficient to generate reproducible results.

4.1.2 Trip Blanks

As shown in Appendix A, no analytes were detected in any of the three trip blanks. This indicates that sample handling and shipping protocols were sufficient to maintain sample integrity.

4.1.3 Equipment Blank

As shown on Appendix A, chloroform and 1,1,1-trichloroethane (1,1,1-TCA) were detected in the equipment blank (sample 140101-058). Acetone was also detected but because it is not a method 601 analyte, it was not reported on the laboratory results sheet. These compounds were not detected in a sample from well 11 taken immediately prior to equipment decontamination. Acetone was used during decontamination procedures after well 11 was sampled. Chloroform and 1,1,1-TCA are common acetone impurities. It appears that these three compounds were introduced during equipment decontamination. Because none were detected in any actual samples, they do not effect the integrity of the sample results.

4.2 LABORATORY QA/QC

Energy Laboratories conducted three spiked analyses, three laboratory duplicate analyses, and three sets of EPA QA/QC samples to validate laboratory procedures. ELI's QA/QC plan is on file at the MDHES.

4.2.1 Spiked Analyses

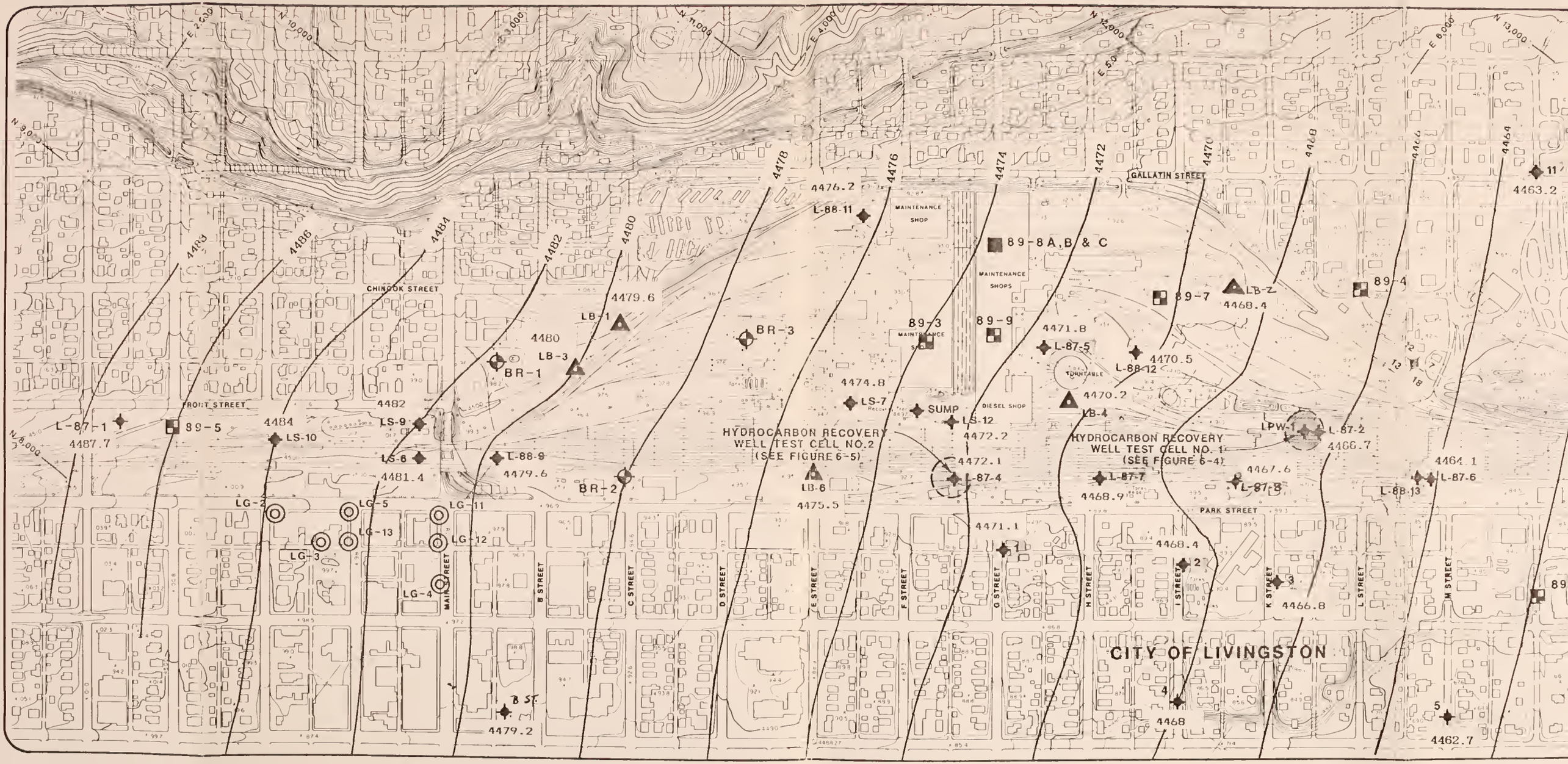
Spiked analyses were conducted on samples 140101-042, 140101-051, and 140101-055. Results of these analyses are shown in Appendix A. The percent recoveries of the test values are all within the acceptable ranges. These results indicate that ELI's laboratory equipment and procedures were adequate to provide satisfactory results.

4.2.2 Laboratory Duplicate Analyses

ELI performed duplicate analyses on samples 140101-046, 140101-051, and 140101-054. As shown in Appendix A, the concentrations of VOC's reported in the duplicate analyses were very close to those reported in the original sample analyses. This indicates that laboratory equipment and procedures were adequate to provide reproducible analytical results.

4.2.3 EPA QA/QC Sample Analyses

ELI analyzed three sets of EPA QA/QC reference samples in addition to samples submitted by Envirocon. All test values were within acceptable ranges for percent recoveries. These results indicate that laboratory equipment and procedures were adequate to provide accurate results.


CHINOOK STREET
FRONT STREET
MAIN STREET
B STREET
C STREET
D STREET
E STREET
F STREET
G STREET
H STREET
I STREET
K STREET
L STREET
M STREET
PARK STREET
GALLATIN STREET
MAINTENANCE SHOP
MAINTENANCE SHOPS
DIESEL SHOP
TURNTABLE
HYDROCARBON RECOVERY WELL TEST CELL NO.2 (SEE FIGURE 6-5)
HYDROCARBON RECOVERY WELL TEST CELL NO. 1 (SEE FIGURE 6-4)
CITY OF LIVINGSTON
L-87-1
4487.7
89-5
LS-10
LS-9
LS-8
4481.4
L-88-9
4479.6
BR-1
4480
LB-3
LB-1
4479.6
BR-2
LG-2
LG-3
LG-4
LG-5
LG-13
LG-11
LG-12
B ST
4479.2
BR-3
L-88-11
4476.2
LB-6
4475.5
LS-7
4474.8
SUMP
LS-12
4472.2
L-87-4
4472.1
89-3
89-9
89-8A,B & C
4471.8
L-87-5
L-88-12
4470.5
LB-4
4470.2
L-87-7
4468.9
L-87-8
4467.6
89-7
LB-2
4468.4
89-4
LPW-1
L-87-2
4466.7
L-88-13
4464.1
L-87-6
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E 3,000
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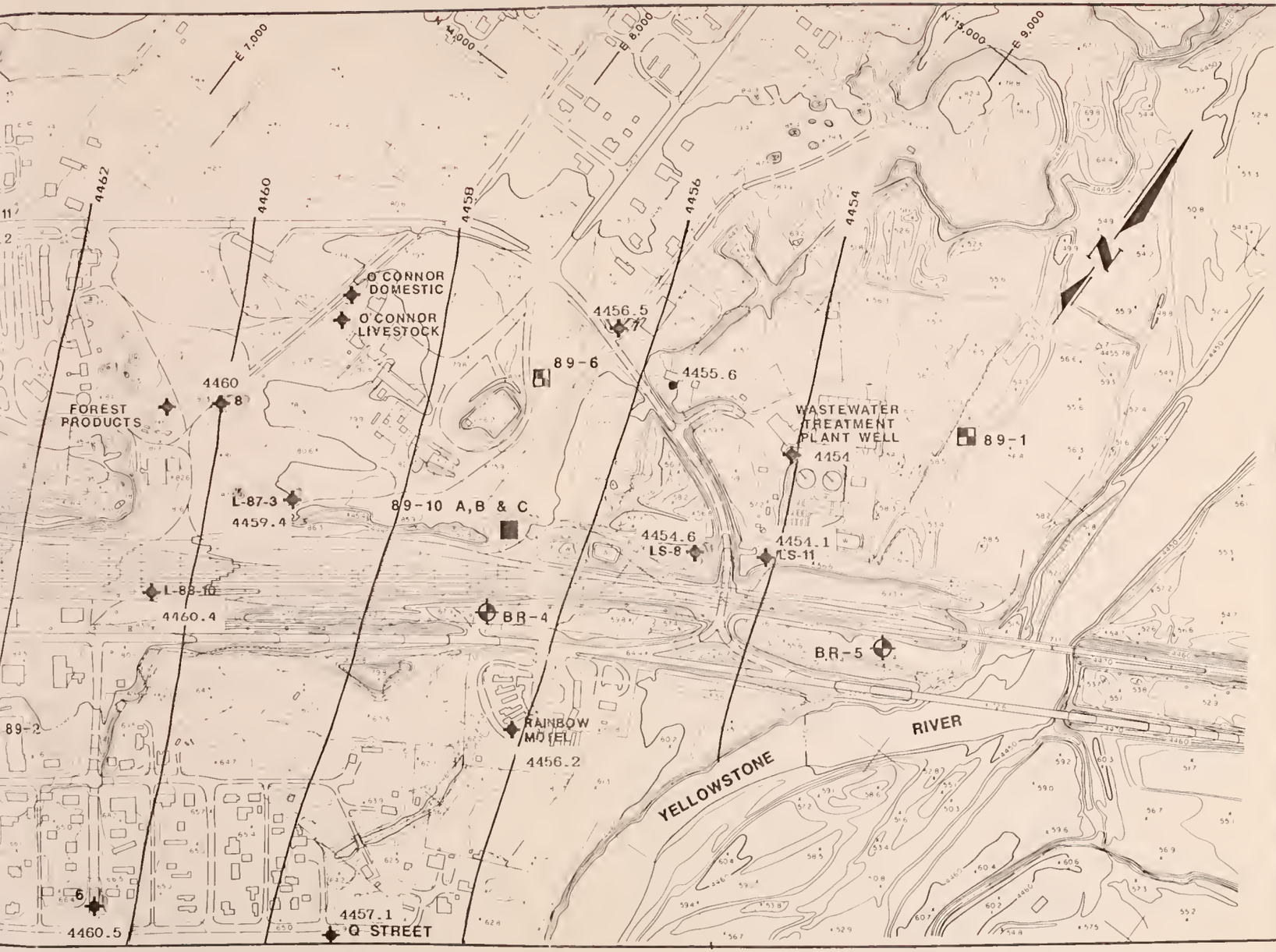
E 5,000
E 6,000



LEGEND

- EXISTING MONITORING WELLS
- PROPOSED MONITORING WELL
- PROPOSED NESTED WELL LOCATIONS
- PROPOSED BEDROCK BORING (BACKFILLED UPON COMPLETION)
- EXISTING PIEZOMETER
- EXISTING HYDROMETRICS WELL
- 4468 WATER TABLE ELEVATIONS
- WELLS SAMPLED DURING SAMPLING ROUND

300 150 0 300 600 FEET

2' CONTOUR INTERVAL

PROJECT NO. 18301	ENVIROCON	FIGURE 1.0 Wells Sampled During July Sampling Round With Potentiometric Contours
DATE 9/89		
REVISION 0		